the rumbling of vehicles (not more than twenty feet away) passing on a road overhead could be distinctly heard. In all probability the beetles of this cave penetrate much nearer the surface than this. Some of the other species are common under rocks and wood in the shade of overhanging cliffs at the mouths of caves where they are associated with the Carabidæ commonly found in such places. The isolation, such as it is, is largely voluntary on the part of the insects, and I can see nothing in the surroundings or habits which would indicate that they have ever been more completely isolated than they are now. I believe, on the contrary, that they are more completely isolated now, from specialization, than ever before.

In short, a reconnaissance of the zoölogy of Kentucky, which the writer has had an opportunity to make during the past two years, satisfies him that the evolution of the structures which characterize our cave species is to be considered apart from the question as to the age of Mammoth Cave, and that the origin of our aquatic cave fauna is in some respects a separate question from that touching the origin of the insect fauna.

Of these matters I hope to have something further to present in the future. Of the insects I may say now that there appears to have been after the Champlain period a migration towards Mammoth Cave of cave insects from the south and east, where the continent had not been so greatly affected by changes of level as was the Mississippi valley. Some observations in my possession tend to show that cave species are now abundant in the vicinity of the mountains of Eastern Kentucky. In fact much of the eastern end of the State appears to be adapted to an extensive subterranean fauna It was a source of wonder to me during the first few months of my residence at Lexington how the rainfall disappeared so rapidly. A precipitation, which in central Illinois would have left its traces in muddy roads and swollen streams for weeks, disappears here in the course of forty-eight hours, having been swallowed up by a network of fissures in the underlying limestone and hurried down to the Kentucky River. These fissures are co-extensive with the Trenton limestone of this locality, and constitute the natural drainage system of the blue grass region of Kentucky. The wonder is not where the rainfall goes, but that any at all should remain at the surface. It early occurred to me that one might find cave animals in these fissures could he but get access to them. This can be done in some cases in quarries, and I can say as the result of preliminary exploration that some cave insects do occur here, and that at least one blind beetle is as abundant as it well could be. On a single visit to one of these opened channels I have, with the aid of a pupil, taken over one hundred specimens of the new species here described. It is without trace of external organs of vision, but like the earthworms possesses the power of recognizing light, a power which is evidently of some importance to it. It occurs in channels seemingly wherever there is food and moisture, and may be collected in the dim light near the openings. For some time I have kept forty individuals of this little beetle in my cellar where it appears to be perfectly at home, although during the day the light is never wholly excluded from its quarters. It wanders about freely, but may be sent scampering to cover by a flash of strong light. The food evidently consists of dead animal matter, such as insects and small mammals which are carried into fissures by freshets. This supply must be very great, though perhaps somewhat irregular; but this latter is a feature of the available food supply of many ordinary insects. Dead grasshoppers carried into the fissures are eagerly devoured. Food is evidently discovered by the sense of smell. In three minutes after placing a freshly killed grasshopper on the ground in one of the channels, several beetles were found at work on it. In confinement the beetles collect on such food after the manner of small ants, and eventually leave only the empty crust.

Anophthalmus horni, n. s. Somewhat depressed; smooth and shining; head, thorax, elytra, and abdomen everywhere provided with scant, erect, microscopic pubescence. Head oval; cheeks rounded; dorsal linear impressions rather deep; surface between the impressions very finely transversely rugulose; mentum tooth prominent, bicuspid. Antennæ densely pubescent excepting the thickened basal segment, which is smooth and shining, with a few hairs near its distal extremity. Thorax trapezoidal, larger than the head; sides strongly arcuate in front; sinuate behind; the hind angles acute but not produced; basal impressions deep, separated by a ridge at which the well-marked median linear impression terminates; truncate behind, but with a shallow emargination at each side separated by a wider median one; margin of contracted posterior part a trifle convex before the posterior angles. Elytra oblong oval, widest a little in front of the middle, truncate in front with the rounded humeri rather prominent; humeral margin obsoletely serrulate under a high magnifying power; striæ very evident next the suture, becoming obscure next the outer margin, obsoletely punctured, the third and fourth broken near the middle by a dorsal puncture, the sutural stria recurved at the posterior extremity of the elytron, joining the third; four rather strong punctures within each humeral margin, the second of which gives rise to one of the long setæ. Color pale fulvous, fading on posterior part of elytra to yellowish white, or cream color; curved impressions of head, edge of prothorax behind and at sides, rims about coxæ, etc., darker; length of body 3.67–4 millimeters; antennæ, 2–2.28 millimeters; length of head, 0.64 millimeter; width of head, 0.60 millimeter; length of thorax, 0.72 millimeter; width of thorax, 0.80 millimeter; width of thorax at base, 0.66 millimeter.

The species is closely related to *A. pusio*, Horn, from the Carter caves of eastern Kentucky, agreeing in size, in the absence of evident serrulation at the humeral margins of the elytra, and in the deep basal impressions of the prothorax. It differs in the size and shape of the prothorax, *A. pusio* having a very small prothorax, "not as long as the head and scarcely larger," whereas in this beetle the prothorax is distinctly larger than the head. The prothorax in *A. pusio* is as wide as long, and contracts in width somewhat gradually from the front, while in the new species this division of the body is broadly rounded at the sides, contracting rather abruptly behind. *A. pusio* is said to have pubescence only at the bases of the elytra. In this species the pubescence is rather scant, but is present on all the surfaces. The new species was discovered within the corporate limits of Lexington in the spring of 1890. It is named in honor of Dr. G. H. Horn of Philadelphia, who has contributed much towards an accurate knowledge of our species of Anophthalmus.

State College of Kentucky, Lexington, Oct. 8.

THE BOTANICAL LIBRARY OF A STATION BOTANIST.

BY A. S. HITCHCOCK.

PROBABLY the most essential part of the special equipment of a botanist to an experiment station is his working library. At least a part of the work of a station should be original investigation. In order that the results of his investigation should be an addition to the sum total of the world's knowledge, it is obviously desirable that the investigator should know all that has been published on the subject up to the time he presents his own results to the public. In the scientific world results are said to be known when they are put on record; that is, when they are published. If all the results of botanical investigation were published in one periodical, it would be an easy matter to hunt up the literature on a given subject. If all the results were to be found in botanical periodicals in the English, French, or German language, our work would be less easy, but still not difficult. But, lo! where must we look for our information? In botanical periodicals in all languages. I doubt if there be a station botanist in this country who can readily read all the botanical literature published in Europe. This statement will probably hold good if we exclude the Hungarian, Polish, and Russian; and most of us are confined to French, German, Latin, and possibly Italian. But this is not the worst; we must look through the proceedings of a multitude of scientific societies, prominent ones whose proceedings are readily accessible in the larger libraries, others more or less local and little known. But even this is not the worst; we find botanical literature in periodicals or proceedings devoted to general science, or even to miscellaneous matters. Sometimes it is tucked

away in a seed catalogue, a weekly agricultural paper, or even a college monthly. Fortunately there is a growing tendency to have articles reprinted and distributed more or less freely among contemporaries. In addition to these various channels of publication, we have the thousands of books, pamphlets, and sheets devoted more or less to botanical subjects.

It is obviously impossible for a station botanist to have ready access to even a tenth-part of the accumulated literature. It is only at the larger public institutions that an attempt toward completeness is made.

But in botany, as in other sciences, the period has long since been reached when classification of its literature was necessary. Thus with the proper aids it is possible for every botanist to become fairly familiar with the literature on any subject.

Probably there are as many opinions as there are station botanists as to the selection to be made of these aids, and it is the object of this paper to give one opinion out of the many.

First, as to the periodicals; assuming, as is generally the case, that the funds for library purposes are quite limited. Most of us take from our own country at least the *Botanical Gazette* and the *Bulletin of the Torrey Botanical Club*. The latter is especially useful for its "Index to Recent Literature Relating to American Botany."

Of foreign periodicals I would mention the *Botanisches Centralblatt*, for its "Referate," under which heading are given classified reviews of important articles, and for its "Neue Litteratur," which is an index, and a very complete one, to the current literature in all languages; the *Revue Générale de Botanique*, for its excellent reviews of the work done in various departments of botany during a given period; and the *Societatum Litterae*, giving monthly a classified list of articles published in the proceedings of scientific societies.

All will agree that by far the most important work is *Just's Botanischer Jahresbericht*. This gives an abstract, long or short, according to importance, of all the botanical articles published during the year. It is well indexed and classified.

Most of the station botanists are working more or less in special lines. The above-mentioned works will enable him to get at least the titles, and often an abstract of the contents, of nearly all the articles that have been published on his special subject. The most difficult period to cover is the last few months. *Just's Jahresbericht* is about two years behind, and the *Centralblatt* usually at least a few months.

Having at hand the titles and authors on a given subject, it is often desirable, or even necessary, to obtain the articles. Books, pamphlets, and reprints can usually be picked up through dealers in second-hand books. Separate numbers of the current periodicals and proceedings can usually be obtained. There remain such articles as are to be found only in the back numbers of serials. These are often very important and difficult to obtain. It is out of the question to think of purchasing these expensive works, for station libraries have too limited an income for this purpose. A good way is to be on the lookout for separate volumes containing the articles desired. But this requires some knowledge of the serials.

Three important works for this purpose and for botanical bibliography in general are Pritzel's "Thesaurus Literaturae Botanicae," Bolton's "Catalogue of Scientific Periodicals," and Scudder's "Catalogue of Scientific Serials."

After one obtains all the articles possible in this way, there will still be many that are unattainable. For these one must consult a large library. Short articles can then be copied, and notes can be taken of long ones. Photography will doubtless, in the future, play an important part in copying rare articles and plates. This can be done at a comparatively small expenditure of time and money, and has the immense advantage of being certainly correct.

I have said nothing about the selection of general works of reference and other books, as this depends so much on individual opinion and the line of work followed; but the above-mentioned aids to the botanist seem to me to be a necessary part of the equipment of every experiment station.

Agricultural College Experiment Station, Manhattan, Kansas.

FORENSIC MICROSCOPY.

BY L. A. HARDING, B.SC., PH.D.

FORENSIC Microscopy, like Forensic Medicine, has a close connection to law; it also deals with cases which are closely interwoven with the administration of justice, and with questions that involve the civil rights and social duties of individuals, the detection of poisons as well as the treatments of the recovery of poison from the poisoned. More and more in the history of the criminal courts is the demand occasioned for the application of the microscope, and microscopical toxicology. Although of late a certain line of medico-legal research has been obliged to combat with the works of the undertaker, who, when preserving the bodies of the dead, employs preservative compounds, largely composed of arsenical and mercurial compounds, while there is no question as to their preservative properties, yet the question arises, Is it good policy, is it for the good of the community at large, to employ embalming fluids composed of such poisonous substances? Criminals may easily hide their heinous crimes by having their victims embalmed, and who is there to tell which of the poisons was administered by the hand of the coward who did not dare to do his work before the world and openly, who for pecuniary or other reasons sought this road to remove a good man, nay, perhaps the man least to be spared, and who is there to identify the poison introduced by legitimate (?) means from that introduced with murderous designs? Yet, despite this opposing energy, despite the seemingly unsurmountable difficulties which surround forensic microscopy and toxicology on every side, we are still making progress and demonstrate that "forensic microscopy" is destined to be a branch of science which cannot be ignored, try as the opposers may.

If we measure the future by the work and benefits the microscope has done in the past, it will be seen that a very bright prospect is awaiting us indeed. No instrument yet devised by the ingenuity of man can compare with the microscope in its universal application to research in the broad domain of science, and I will endeavor in a brief way to call attention to a few of its special relations to law.

The direct application of the microscope to law dates back to about 1835, and ever since that time it has made a record for itself in convicting the guilty and protecting the innocent. The expedient taught to us by Albertus in 1226, that the victim's wounds would open afresh in the presence of the slayer, or the custom honored from time immemorial of watching the effect upon the suspected criminal as he touched the dead body of his supposed victim, we no longer are obliged to resort to. In the early age of forensic microscopy, its application was simply confined to a few questions of criminal law; but the more it attained perfectness in lenses, the excellent means of determining minute measurements, the adaptation of the spectroscope, and numerous valuable mechanical appliances, it has claimed so much attention in civil and criminal law that its usefulness cannot be denied. Although the microscope has played a very important part for a number of years in noted criminal and civil cases, its proper relation to law seems to be little understood. It is true that many underrate its value, and throw aside all testimony attained through its use as worthless, while others again largely overrate its powers. It is a well-known fact, though an unfortunate existing condition of affairs, that persons are permitted to give expert testimony in branches where they have but little more knowledge than the court before whom they testify. It is largely from this cause that so much discredit has been thrown upon the whole field of expert testimony, especially in this country. This condition of fact does not alone relate to forensic microscopy, but it has invaded all branches of expert testimony.

When, however, persons expert in the use of the microscope are called upon to give testimony, there ought not to be any disagreement as to the result of the examination they may make; as, for instance, if they examine a stain, and blood corpuscles are found by one, it should be verified by the other; and, if measurements of these corpuscles are made, their measures should correspond without a doubt. There should be no difference on such matters of fact, though this is not meant to imply that they should